The Index Investor

Invest Wisely…Get an Impartial Second Opinion.

Contents

This Month's Issue: Key Points

This is the year of our biennial asset allocation review at The Index Investor. Our feature article this month reviews the key issues we will address. We begin with a discussion of how an investor's goals should be specified in the asset allocation process. We find the theoretical support for approaches based on "investor utility" (e.g., the use of "risk capacity" surveys) remains hotly contested. We conclude that focusing on shortfall versus a long-term accumulation goal (and associated compound annual real portfolio return target) still makes the most sense. We then review three key questions: what variables are important to achieving our asset allocation goals, how are they related, and what will their values be in the future. We continue to prefer broadly defined asset classes, which are more consistent with economic theory and also produce more stable asset allocation solutions. We review new asset classes that we are considering for inclusion in our model portfolios. We would like to include foreign currency real return bonds, but there is currently a lack of investment vehicles. This is not the case with foreign commercial property and timber, which we will probably

  ISSN 1554-5075

include. We continue to analyze other asset classes, including physical gold, domestic high yield nominal return bonds, emerging market bonds, bank loans, private equity; and U.S. equity market volatility. We also review the importance of explicitly addressing rebalancing rules as part of an asset allocation solution.

We go on to discuss the single period (cross-sectional) and multi-period (intertemporal) relationships between asset classes. We note that while most approaches to asset allocation address the former (via estimation of returns correlation coefficients), the latter are equally important, but much less often modeled. We review key intertemporal issues (e.g., volatility clustering and asymmetric correlations) as well as attempts to model them via regime switching models.

With respect to the future values of key asset class variables, we review the trade-offs between using historical data (which produces estimation errors) and forward looking models (which produces modeling error). We also review the advantages and disadvantages of assuming that asset class returns are normally distributed, versus trying to explicitly incorporate the non-normal distributions that characterize the historical returns on many asset classes. Last but not least, we briefly review the challenges in identifying robust (if not technically optimal) solutions to complex multi-period, multi-asset class allocation and rebalancing problems.

This month's product and strategy notes look at four subjects. Robert Shiller, a widely respected economist, has just published an interesting article that is critical of lifecycle funds. Morgan Stanley Capital International has just launched its Global Capital Markets Index, which incorporates all of the world's equity and bond markets (but not commodities, real estate, private equity, bank loans, and some other important asset classes). Our key criticism is its use of market capitalization weighting in its underlying bond market indices. As we noted in our December, 2004 article, "Investing in Debt Markets", we have concluded that market capitalization weighting does not provide a good picture of value creation in fixed income markets. We also review developments on the regulatory front, including potential new regulations on "soft commissions" and the conflict between stockbrokers and investment advisers. Finally, we review newly launched commercial property products, including new international funds from Cohen and Steers and a new ETF that tracks the EPRA Eurozone Index.

ISSN 1554-5075

This Month's Letters to the Editor

How do foreign currency index certificates of deposit from Everbank compared to foreign currency bond funds?

The Everbank Prudent Central Bank Index CD has 25% of its exposure in each of Australian Dollars, New Zealand Dollars, Euro and UK Pounds. In contrast, while actively managed, RBPIBX generally tracks the JP Morgan Global Government Bond (non-dollar) Index. For example, over the 10 years ended 31 December 2004, RPIBX had a nominal compound annual rate of return of 7.15%, versus a CAGR of 7.76% on the index. Not bad, considering its expense charge (about 90 basis points now, but somewhat higher earlier in the ten year period). The JP Morgan index is market capitalization weighted. As we noted in our December, 2004 article on Investing in Debt Markets, this is a logical approach in equity markets, but a somewhat problematic one in debt markets, since it can give greater weight to lower quality borrowers who are simply issuing a lot of debt, rather than creating a lot of value for bondholders. The substantial weight of Yen issues in many international bond indexes (which is largely due to Japan's heavy debt issuance during its repeated attempts to pull its economy out of its prolonged deflationary recession) is a good example of this phenomenon. This is very relevant for RPIBX, which had the following currency exposures at the end of 2004: Euro, 48%, Yen, 33%, UK Pound, 6%, Swedish Kroner, 4%, Canadian Dollar, 2%, and all others, 7%. As you can see, the currency exposure of RPIBX and the Everbank Prudent Central Bank Index CD are quite different. Only time will tell which will turn out to be the superior allocation. However, as a general matter of principle, when it comes to bond market investing, we are moving more and more for towards a preference for equally weighted indices like the one employed by Everbank.

I am trying to build up a large direct holding of index linked bonds looking towards building a low return/low risk portfolio. As a GBP investor, domestic "linkers" lack deflation proofing and I need to cover this. I have a (bewilderingly long) list of alternatives from a broker but I can't find any information as to deflation protection other than US$ TIPS which are perhaps not the wisest route for us at the moment. Any thoughts?

Currently, real return bonds issued by the United States, Australia, and France offer so-called "par-value" protection against deflation (i.e., at maturity, they promise to pay the greater of

ISSN 1554-5075

inflation adjusted capital or original par value). Also, two of the Swedish Government real return bond issues (numbers 3104 and 3105) also have this feature. In addition, as we have noted in our writing, under a deflationary scenario, nominal return bonds issued by governments should also do well, at least as long as investors continue to have confidence in said government's future ability and willingness to repay and/or said government avoids the temptation to push up the rate of inflation, in the belief that, compared to deflation, it is politically the lesser of two evils.

Given low current real yields, and the tax disadvantages of holding U.S. TIPS [real return bonds] in a taxable account, can't an investor protect him or herself against future inflation just by holding short-term nominal return government bonds?

We agree with you that yields on real return bonds are currently low relative to their historical averages. An important exception to this is Australia, where real yields remain relatively high. We believe there are two reasons for the low yields elsewhere. The first is structural: many defined benefit pension plans with long-term liabilities have discovered that long-term real return bonds are the best way to match fund them. Hence, there is a source of demand in the market that is relatively insensitive to current yields. Given the current issuance levels by governments, this has a tendency to bid up the price of real return bonds and depress their yields. We believe the second cause of low real yields is the current state of the global economy. Theoretically, the real rate of interest should reflect the marginal productivity of capital – that is, the compensation to an investor for deferring consumption and instead making an investment that will increase output at a later date. As we noted in last month's economic update, we are now facing conditions in which domestic demand growth in the United States is slowing, which will probably cause a slowdown in China as well. In addition, domestic demand growth has been weak in other areas (e.g., the Eurozone and Asia) for some time. Given weak expected global demand, the marginal expected return on capital should also, logically, be low. However, the real rate of interest is also a price that reflects the balance of demand for investable funds, and their supply via savings. In this regard, while savings are low in the United States, this is not so elsewhere in the world, where they are quite high. Hence, the combination of a relatively low demand for investable funds (due to the low expected marginal productivity of capital) and a relatively high supply of them has also led to very low real interest rates around the world. Australia is an intriguing exception to

ISSN 1554-5075

this general view. The continued existence of high real yields in Australia implies that the global market for real return bonds is not perfectly integrated. This raises the question of what could be keeping real yields high in Australia. On the one hand, as is true of other countries in the Anglosphere, domestic savings are relatively low. However, it strikes us that cannot be the full story. The expected marginal productivity of capital may also be higher in Australia. One of the key reasons for this may be that country's relative success in addressing issues related to social pensions and national healthcare that remain unresolved in most other countries. In other words, high real yields may reflect investors' belief that Australia is not just "the lucky country", but a smart one too. Elsewhere, however, if one wanted to lock in a long-term real rate of return via the purchase of long maturity real return bonds, this might not be the best time to do this. On the other hand, it is unclear, given our outlook for the world economy, how long it will take for real rates to return to, or exceed, their historic averages.

We completely agree on the tax issue with respect to TIPS, and note it in our writing about real return bonds asset class. For the reason you mention, we believe that TIPS should only be held in tax-advantaged accounts. We also believe that Series I Savings Bonds are a more attractive way to hold real return bonds in the United States, since they increase in value every year, and also have the deflation protection that TIPS provide. Unfortunately, an individual can only purchase $30,000 per year in I-Bonds. Unfortunately, using nominal return government bonds you cannot replicate, with the same degree of certainty, the inflation provided by TIPS or I-Bonds. Broadly speaking, while very short term U.S. Treasury securities have, in the past (which as we all know may not be a good indication of what lies ahead) done a good job of keeping pace with consumer price inflation (which is not always a good measure of the actual inflation experienced by investors), their real returns have been relatively low. Alternatively, intermediate term U.S. Treasuries have provided better real returns, but with more volatility. From our perspective, the best answer by far for individual investors would be to raise the ceiling on the amount of Series I bonds that can be purchased each year.

ISSN 1554-5075

Global Asset Class Returns

YTD 29Apr05	In USD	In AUD	In CAD	In EURO	In JPY	In GBP
Asset Held						
US Bonds	0.90%	1.29%	5.43%	5.92%	3.23%	1.42%
US Prop.	-2.00%	-1.61%	2.53%	3.02%	0.33%	-1.48%
US Equity	-4.70%	-4.31%	-0.17%	0.32%	-2.37%	-4.18%
AUS Bonds	-0.58%	-0.19%	3.94%	4.44%	1.74%	-0.06%
AUS Prop.	-5.93%	-5.54%	-1.40%	-0.91%	-3.61%	-5.41%
AUS Equity	0.84%	1.23%	5.37%	5.86%	3.16%	1.36%
CAN Bonds	-2.12%	-1.73%	2.41%	2.90%	0.21%	-1.60%
CAN Prop.	-3.67%	-3.28%	0.85%	1.35%	-1.35%	-3.15%
CAN Equity	-3.07%	-2.67%	1.46%	1.96%	-0.74%	-2.54%
Euro Bonds	-2.36%	-1.97%	2.17%	2.66%	-0.03%	-1.84%
Euro Prop.	0.07%	0.46%	4.60%	5.10%	2.40%	0.59%
Euro Equity	-3.86%	-3.46%	0.67%	1.17%	-1.53%	-3.34%
Japan Bonds	-1.14%	-0.75%	3.39%	3.88%	1.19%	-0.62%
Japan Prop.	0.43%	0.83%	4.96%	5.46%	2.76%	0.95%
Japan Equity	-6.14%	-5.74%	-1.61%	-1.11%	-3.81%	-5.61%
UK Bonds	1.17%	1.56%	5.70%	6.19%	3.50%	1.69%
UK Prop.	-4.63%	-4.23%	-0.10%	0.40%	-2.30%	-4.10%
UK Equity	-1.00%	-0.60%	3.53%	4.03%	1.33%	-0.47%
World Bonds	-0.45%	-0.06%	4.08%	4.57%	1.88%	0.07%
World Prop.	-2.10%	-1.71%	2.43%	2.92%	0.23%	-1.58%
World Equity	-3.40%	-3.01%	1.13%	1.62%	-1.07%	-2.88%
Commodities	6.40%	6.79%	10.93%	11.42%	8.73%	6.92%
Hedge Funds	-1.09%	-0.70%	3.44%	3.93%	1.24%	-0.57%
A$	-0.39%	0.00%	4.13%	4.63%	1.93%	0.13%
C$	-4.53%	-4.13%	0.00%	0.50%	-2.20%	-4.01%
Euro	-5.02%	-4.63%	-0.50%	0.00%	-2.70%	-4.50%
Yen	-2.33%	-1.93%	2.20%	2.70%	0.00%	-1.80%
UK£	-0.52%	-0.13%	4.01%	4.50%	1.80%	0.00%
US$	0.00%	0.39%	4.53%	5.02%	2.33%	0.52%

ISSN 1554-5075

Equity and Bond Market Valuation Update

Our equity market valuation analysis rests on two fundamental assumptions. The first is that the long term real equity risk premium is 4.0% per year. The second is the average rate of productivity growth an economy will achieve in the future. Because future growth rates are uncertain, we use both high and a low productivity growth assumptions for each region. Given these assumptions, here is our updated market valuation analysis at the end of last month:

Country	Real Risk Free Rate Plus	Equity Risk Premium Equals	Required Real Return on Equities	Expected Real Growth Rate* plus	Dividend Yield Equals	Expected Real Equity Return**
Australia	2.71%	4.00%	6.71%	4.90%	3.89%	8.79%
Canada	1.88%	4.00%	5.88%	2.10%	1.84%	3.94%
Eurozone	1.44%	4.00%	5.44%	2.50%	2.96%	5.46%
Japan	0.27%	4.00%	4.27%	2.80%	1.04%	3.84%
U.K.	1.65%	4.00%	5.65%	2.50%	3.30%	5.80%
U.S.A.	1.60%	4.00%	5.60%	4.50%	1.79%	6.29%

*High Productivity Growth Scenario..

*** When required real equity return is greater than expected real equity return, theoretical index value will be less than actual index value – i.e., the market will appear to be overvalued.*

Country	Implied Index Value[1]	Current Index Value	Current to Implied Value Under High Growth Scenario[2]	Current to Implied Value Under Low Growth Scenario
Australia	215.04	100.00	47%	72%
Canada	48.70	100.00	205%	260%
Eurozone	100.65	100.00	99%	150%
Japan	70.60	100.00	142%	238%
U.K.	104.63	100.00	96%	141%
U.S.A.	162.14	100.00	62%	118%

[1]*High productivity growth scenario.* [2]*Values below 100% indicate undervaluation; more than 100% indicates overvaluation*

ISSN 1554-5075

Our valuation estimate is based on the relationship between the returns an equity market is expected to supply, and those investors are likely to demand. The rate of return the equity market is expected to supply in the future equals current dividend yield plus the expected rate of real long-term economic growth. We use two different growth scenarios, based on relatively higher and lower rates of productivity growth in the future. Also, it should be noted that there is increasing evidence that dividend growth rates for public companies tend to be lower than overall economic growth, due to the fact that the fastest growing companies are often smaller and privately owned. Hence, our valuation estimates are rough ones at best. Changes in the market price/dividend (or price/earnings) ratio also affect the returns supplied. However, because this is driven by psychological factors which we have no basis for predicting, we do not include future price/dividend ratio changes in our analysis.

We define the future equity market return that investors demand to be equal to the current yield on long term real return bonds, plus a four percent long-term equity market risk premium. This risk premium is consistent with historical long-term global equity market returns data. The good news is that two of the factors in our model -- current dividend yields and the real bond return -- are easily obtained from the daily paper. The bad news is that the other two -- the expected rate of dividend growth and the "correct" equity market risk premium -- are two of the most contentious issues in finance. However, if you assume that an equity market is currently in equilibrium (that is, neither under or overvalued), by assuming a value for one of these variables, you can derive an estimate of the market's current expectation for the other. Specifically, the market's current implied rate of future dividend growth equals the current real bond yield plus the four percent equity market risk premium less the current dividend yield. Similarly, the market's current implied equity market risk premium equals the current dividend yield plus our estimated future growth rate less the current real bond yield.

While we do not believe that financial markets are always in equilibrium, we do believe that they are strongly attracted to it. Hence, these estimates provide a further perspective on the reasonableness of current equity market valuation levels. These estimates are shown in the following table:

ISSN 1554-5075

	Current Dividend Yield	Current Real Bond Yield	Implied Future Real Growth Rate, Assuming 4% ERP	Implied ERP, Assuming Low Future Growth Scenario	Implied ERP, Assuming High Future Growth Scenario
Australia	3.89%	2.71%	2.82%	5.08%	6.08%
Canada	1.84%	1.88%	4.04%	1.06%	2.06%
Eurozone	2.96%	1.44%	2.48%	2.52%	4.02%
Japan	1.04%	0.27%	3.23%	2.57%	3.57%
United Kingdom	3.30%	1.65%	2.35%	2.65%	4.15%
United States	1.79%	1.60%	3.81%	3.69%	4.69%

Our government bond market valuation update is based on the same supply and demand methodology we use for our equity market valuation update. In this case, the supply of future fixed income returns is equal to the current nominal yield on ten-year government bonds. The demand for future returns is equal to the current real bond yield plus the historical average inflation premium (the difference between nominal and real bond yields) between 1989 and 2003. To estimate of the degree of over or undervaluation for a bond market, we use the rate of return supplied and the rate of return demanded to calculate the present values of a ten year zero coupon government bond, and then compare them. If the rate supplied is higher than the rate demanded, the market will appear to be undervalued. This information is contained in the following table:

	Current Real Rate	Average Inflation Premium (89-03)	Required Nominal Return	Nominal Return Supplied (10 year Govt)	Return Gap	Asset Class Over or (Under) Valuation, based on 10 year zero
Australia	2.71%	2.96%	5.67%	5.35%	-0.32%	3.07%
Canada	1.88%	2.40%	4.28%	4.14%	-0.14%	1.33%
Eurozone	1.44%	2.37%	3.81%	3.40%	-0.41%	4.05%
Japan	0.27%	0.77%	1.04%	1.25%	0.21%	-2.03%

ISSN 1554-5075

	Current Real Rate	Average Inflation Premium (89-03)	Required Nominal Return	Nominal Return Supplied (10 year Govt)	Return Gap	Asset Class Over or (Under) Valuation, based on 10 year zero
UK	1.65%	3.17%	4.82%	4.53%	-0.29%	2.85%
USA	1.60%	2.93%	4.53%	4.19%	-0.34%	3.35%

It is important to note that this analysis looks only at ten-year government bonds. The relative valuation of non-government bond markets is also affected by the extent to which their respective credit spreads (that is, the difference in yield between an investment grade or high yield corporate bond and a government bond of comparable maturity) are above or below their historical averages (with below average credit spreads indicating potential overvaluation). Today, in many markets credit spreads are at the low end of their historical ranges.

Finally, for an investor contemplating the purchase of foreign bonds or equities, the expected future annual percentage change in the exchange rate is also important. Study after study has shown that there is no reliable way to forecast this. At best, you can make an estimate that is justified in theory, knowing that in practice it will not turn out to be accurate. That is what we have chosen to do here. Specifically, we have taken the difference between the yields on ten- year government bonds as our estimate of the likely future annual change in exchange rates between two regions. This information is summarized in the following table:

Annual Exchange Rate Changes Implied by Bond Market Yields

	To A$	**To C$**	**To EU**	**To YEN**	**To GBP**	**To US$**
From						
A$	0.00%	-1.21%	-1.95%	-4.10%	-0.82%	-1.16%
C$	1.21%	0.00%	-0.74%	-2.89%	0.39%	0.05%
EU	1.95%	0.74%	0.00%	-2.15%	1.13%	0.79%
YEN	4.10%	2.89%	2.15%	0.00%	3.28%	2.94%
GBP	0.82%	-0.39%	-1.13%	-3.28%	0.00%	-0.34%
US$	1.16%	-0.05%	-0.79%	-2.94%	0.34%	0.00%

ISSN 1554-5075

Sector and Style Rotation Watch

The following table shows a number of classic style and sector rotation strategies that attempt to generate above index returns by correctly forecasting turning points in the economy. This table assumes that active investors are trying to earn high returns by investing today in the styles and sectors that will perform best in the next stage of the economic cycle. The logic behind this is as follows: Theoretically, the fair price of an asset (also known as its fundamental value) is equal to the present value of the future cash flows it is expected to produce, discounted at a rate that reflects their relative riskiness. Current economic conditions affect the current cash flow an asset produces. Future economic conditions affect future cash flows and discount rates. Because they are more numerous, expected future cash flows have a much bigger impact on the fundamental value of an asset than do current cash flows. Hence, if an investor is attempting to earn a positive return by purchasing today an asset whose value (and price) will increase in the future, he or she needs to accurately forecast the future value of that asset. To do this, he or she needs to forecast future economic conditions, and their impact on future cash flows and the future discount rate. Moreover, an investor also needs to do this before the majority of other investors reach the same conclusion about the asset's fair value, and through their buying and selling cause its price to adjust to that level (and eliminate the potential excess return).

We publish this table to make an important point: there is nothing unique about the various rotation strategies we describe, which are widely known by many investors. Rather, whatever active management returns (also known as "alpha") they are able to generate is directly related to how accurately (and consistently) one can forecast the turning points in the economic cycle. Regularly getting this right is beyond the skills of most investors. In other words, most of us are better off just getting our asset allocations right, and implementing them via index funds rather than trying to earn extra returns by accurately forecasting the ups and downs of different sub-segments of the U.S. equity and debt markets. That being said, the highest year-to-date returns in the table give a rough indication of how investors employing different strategies expect the economy to perform in the near future. The highest returns in a given row indicate that most investors are anticipating the economic and interest rate

ISSN 1554-5075

conditions noted at the top of the next column. Similar returns in multiple columns (within the same strategy) indicate a relative lack of agreement between investors about the most likely future state of the economy.

Year-to-Date Returns on Classic Rotation Strategies in the U.S. Markets

Economy	Bottoming	Strengthening	Peaking	Weakening
Interest Rates	Falling	Bottom	Rising	Peak
Style Rotation	Growth (IWZ) **-6.41%**	Value (IWW) **-2.62%**	Value (IWW) **-2.62%**	Growth (IWZ) **-6.41%**
Size Rotation	Small (IWM) **-10.59%**	Small (IWM) **-10.59%**	Large (IWB) **-3.35%**	Large (IWB) **-3.35%**
Style and Size Rotation	Small Growth (DSG) **-7.59%**	Small Value (DSV) **-10.37%**	Large Value (ELV) **-2.03%**	Large Growth (ELG) **-8.06%**
Sector Rotation	Cyclicals (IYC) **-8.81%** Technology (IYW) **-11.39%**	Basic Materials (IYM) **-6.35%** Industrials (IYJ) **-5.84%**	Energy (IYE) **10.02%** Staples (IYK) **-3.31%**	Utilities (IDU) **7.06%** Financials (IYF) **-7.04%**
Bond Market Rotation	High Risk (VWEHX) **-2.30%**	Short Maturity (VBISX) **0.10%**	Low Risk (VIPSX) **1.50%**	Long Maturity (VBLTX) **3.00%**

ISSN 1554-5075

2005 Asset Allocation Review: Key Issues

This is the year of our biennial asset allocation review. This article will kick off that process with a review of the key issues facing us. Broadly speaking, when trying to make a decision in the face of uncertainty, it helps to ask four questions:

- What goal are we trying to achieve?
- What variables are important to the achievement of our goal?
- How are those variables related to each other?
- What are the likely values for those variables in the future?

Let's look at each of these in turn, in the context of an investor's asset allocation problem.

<u>What Are Our Goals?</u>

Our target real return model portfolios assume that an investor's primary objective is to fund his or her real (inflation adjusted) retirement liability -- that is, to accumulate, by a certain date, the amount of money he or she assumes will be needed to achieve his or her post-retirement income and bequest goals. The size of this retirement liability (or accumulation target) is a function of five variables:

- The investor's target post retirement income;
- The amount of income that will be provided by non-portfolio sources (e.g., social security benefits or part-time work);
- The size of the investor's future bequest goals;
- The number of years after retirement that the investor expects to live; and
- An estimate of what the real return an investor will earn on his or her portfolio after retirement.

In essence, the accumulation target (retirement liability) is an intermediate goal in a lifetime investment management plan. Once its size has been initially estimated, the next step is to determine the minimum compound annual real rate of return that an investor will need to earn on his or her portfolio over the pre-retirement period. For any given accumulation target, this minimum real portfolio return target is a function of three factors:

ISSN 1554-5075

- The current value of the investor's portfolio;
- The number of years before his or her expected retirement date; and
- The expected amount of annual future savings.

Once the compound annual real return target has been established, the next logical question is to determine the asset allocation that has at least a specified probability of achieving it, while also minimizing the annual volatility of returns. Our assumption here is that both of these goals are important to most investors: not only achieving their long-term savings goals, but also minimizing the annual ups and downs in their portfolio's return.

So far, so good. However, there is another layer of complexity: investors' circumstances can change over time. For example, an investor might receive a windfall gain, that sharply increases the current value of her portfolio. She would then face a number of alternatives. She could (a) increase her target post-retirement income or bequest; (b) plan to retire sooner; (c) reduce her future savings; and/or (d) change her asset allocation to reduce the riskiness of her portfolio.

Using the same logic, an investor who suffered a windfall loss (e.g., an unexpected expense not covered by insurance that reduce the value of their current portfolio) would face the opposite choices.

Because every investor is different, we make no assumptions about which option or options an investor is likely to choose. Rather, we plan to implement changes to our website (similar to those we have used on www.retiredinvestor.com) that will to make it even easier for investors to think through the alternatives they face.

At this point, we should also acknowledge an important point. The approach we take to the definition of investor goals has a long history in finance (see, for example, A.D. Roy's 1952 paper "Safety First and the Holding of Assets"). However, there is another approach that is also widely used.

It starts with the assumption that most people are risk averse. For example, given a choice, many people would prefer a lower guaranteed return (say, $450) to a 50% chance of winning $1,000 and a 50% chance of winning nothing. To think of it another way, the $50 difference between the expected value of the gamble ($500) and the certainty equivalent he or she prefers ($450) is the risk premium the investor would require to participate in the former.

ISSN 1554-5075

In more abstract terms, economists speak of investors seeking to maximize their "utility", which is equal to the expected value adjusted downward by a factor that reflects the investor's aversion to risk. For example, in the world of investing, it is frequently applied in the form of this equation: Expected Utility = The expected return of an asset less (the risk aversion factor times the variance of the asset's returns).

In practical application, this approach leads to the following four step financial planning process: (1) estimate the expected return and variance (i.e., the standard deviation squared) for different asset classes. (2) Use a single period mean/variance optimizer to combine different asset classes into a series of "efficient" portfolios that maximize return for a given level of risk. (3) Establish the investor's risk aversion parameter. (4) Use this parameter to identify a portfolio at some point along the efficient frontier. Unfortunately, while steps (1), (2), and (4) are quite straightforward, step three is very problematic (despite the apparent scientific precision of the "risk capacity surveys" found on various websites and financial planners' desks).

First, there is no agreement among economists on the right theoretical specification for an investor's risk aversion parameter. For example, consider a simple gamble, with a 50% probability of winning nothing, and a 50% probability of losing $10. The expected value of the gamble is a loss of $5. Now consider two players who are offered this gamble: Bill Gates and a homeless person, with only $20 in his pocket. How big a payment would each of these two require to participate in this lottery? One school of thought says that risk aversion decreases with wealth. Hence, Bill Gates might require a payment just equal to the gamble's expected loss of $5; on the other hand, since $5 represents 25% of the homeless man's wealth, he might require much more – perhaps $10. This is known as decreasing absolute risk aversion (DARA). On the other hand, it might be the case that both Bill Gates and the homeless man require a payment of $6, or a premium of $1 above their expected loss of $5. This is known as constant absolute risk aversion (CARA). These are just two of the ways the risk aversion parameter has been formulated by economists. There are many, many more (e.g., power utility, bilinear utility, "S" shaped utility as in Prospect Theory, etc.), all of which involve lots of complicated algebra and Greek notation.

This brings us to the second problem: research has repeatedly found that human beings are not consistent in the way they make risky choices. In other words, their risk aversion

ISSN 1554-5075

parameters have a tendency to change across choices and over time. In our mind, these two problems with expected utility theory make its use in financial planning questionable at best. As described in a recent paper on the subject ("Risky Curves: From Unobservable Utility to Observable Opportunity Sets" by Friedman and Sunder), "Utility functions are neither deduced from fundamental propositions, nor observed directly; they are inferred from observed behavior. The scientific value of such inferred functions derives from their usefulness in predicting out-of-sample observations." However, "fifty years of intensive search have yet to identify scientifically useful non-linear utility functions. Even complex functions …do a poor job of predicting individual behavior in out-of-sample data, in new tasks, and in new contexts."

Given these limitations, in our asset allocation analysis we focus on minimizing the probability of falling short of one or more specific goals, rather than maximizing an abstract measure of "utility."

What Variables Drive The Achievement of our Goals?

Let us now turn to the next question, the variables that are important to the achievement of our specified goals. Broadly, they fall into two classes: variables related to specific asset classes, and variables related to intermediate cash flows (e.g., from new savings or rebalancing) before the target date for the achievement of our accumulation goal.

In past articles, we have noted at length our strong preference for broadly defined asset classes (e.g., domestic equities instead of small cap equities). Our reasoning is twofold. From an economic perspective, we believe that the inclusion of different asset classes in an investor's portfolio should provide her or him with exposure to significantly different return generating processes, and, in so far as possible, diversify (and therefore reduce) the portfolio's exposure to different sources of risk. From this perspective, the commonality between "small cap equities" and the broader "domestic market equities" is too large to justify treating the former as a separate asset class.

From a mathematical perspective, the use of broad asset classes has a second advantage. Because the correlations of returns between broadly defined asset classes is relatively low (e.g., on the order of .5 or less, compared to a correlation of .9 or so between

ISSN 1554-5075

small cap equities and domestic market equities), the resulting asset allocation solutions are much more stable. In this case, stability refers to the extent to which the allocations would change in response to a small change in the input values (e.g., for expected return or volatility) for a one of more asset classes. When correlations are high, a small change in expected return can produce a very large change in allocations. Given that these inputs are all imprecisely estimated (as we will discuss later in this article), this is an important consideration. In practical terms, we want to avoid incurring real costs (e.g., due to rebalancing) in the pursuit of spurious expected benefits (improved portfolio performance) that reflect only statistical noise (e.g., small changes in our estimates of asset class returns, risks and correlations).

That being said, we are still left with a choice of broadly defined asset classes we could potentially include in our asset allocation models. All of our models currently include the following: (1) domestic real return (inflation indexed) bonds; (2) domestic investment grade nominal return bonds; (3) foreign currency investment grade nominal return bonds; (4) domestic securitized commercial property (e.g., REITs); (5) commodity futures; (6) domestic equity; (7) foreign developed market equity; and (8) emerging market equity. Closely related to this basic list are three other asset classes that seem logical to include: (9) foreign currency real return bonds; (10) foreign currency securitized commercial property; and (11) timber, which is not included in the commodity indexes that we currently use (we will have a new article on this next month). With respect to these three possible additions, our key concern is the existence of investment vehicles (ideally indexed, but actively managed if the former are unavailable) in each of these asset classes. Today, not all are available in all the regions covered by our model portfolios. However, because this situation seems to be improving, we are currently leaning towards including these in this year's asset allocation review.

In addition, there are six other asset classes whose use we continue to ponder. These include (12) gold; (13) domestic high yield nominal return bonds; (14) emerging market bonds; (15) bank loans; (16) private equity; and (17) U.S. equity market volatility.

As we have noted in the past, the commodity futures-based index funds that are currently available already include an allocation to gold. However, due to its function as a store of value and medium of exchange, gold also has some aspects of a distinct asset class. These functions specifically apply to physical gold (e.g., coins), and not to futures contracts,

ISSN 1554-5075

nor to shares in gold-backed Exchange Traded Funds (if the financial markets aren't open, your gold coins can still be used to buy bread; your ETF shares cannot). Hence, we are inclined to include physical gold in the same category as cash, which we regard as an asset held for transactional (liquidity) and precautionary reasons (and which we therefore do not include in our model portfolios).

As more fully described in last December's issue ("Investing in Debt Markets"), our key concern with high yield bonds has been that, in comparison with other asset classes now included in our model portfolios, its distribution of historical real returns is significantly more "non-normal". In layman's terms, this means that it is more tilted and has fatter tails than the traditional "bell curve." In statistical terms, it has negative skewness and positive kurtosis, making it more prone to extreme negative returns than other asset classes. As a general rule, as long as the departure of historical returns from a normal distribution is small, one can safely assume that they are normally distributed without a large impact on the probability of achieving an investor's goals (see, for example, "Portfolio Formation with Higher Moments and Plausible Utility" by Cremers, Kritzman and Page). However, this is not true when the departure from normality is large, as is the case with high yield bonds. As we will describe later in this article, we are considering modifications to our asset allocation model that would enable us to include use high yield bonds as an asset class, in spite of its non-normal distribution of returns. However, until we make this decision, we will exclude high yield bonds from our long-term target real return portfolios.

As we also noted in our December issue, our concerns with Emerging Markets Bonds goes beyond the shape of their return distribution. These include the facts that (a) the entire asset class is relatively small (on the order of $200 billion in total market capitalization); (b) the use of market capitalization weighting in the available indices gives high weight to some of the riskiest countries; and (c) given the short length of the available returns data, we do not believe it adequately captures the full range of risk factors affecting this asset class.

We have a considerably more positive view of the risk and return characteristics of bank loans as an asset class. Most importantly, they are easier for lenders and borrowers to renegotiate (which reduces the probability of bankruptcy), and, in a liquidation scenario, are usually senior to bonds (which makes their expected recovery, as a percentage of their face value, higher than high yield bonds). Our concerns at this point are threefold: (a) the

ISSN 1554-5075

availability of suitable retail investment vehicles in markets around the world; (b) the quality of the index data series (improving, but still short in length); and (c) the degree of similarity – returns correlation – with high yield bonds.

In recent years, private equity (e.g., leveraged buyout and venture capital limited partnerships) has received significant allocations in many institutional investors' portfolios. Moreover, the increased regulatory costs imposed by Sarbanes Oxley and similar legislation have reduced the incentives for smaller companies to go public; hence, more of them can only be accessed via private equity investments. Finally, recent years have also seen the launch of parallel public closed end funds by a number of large private equity firms, which make this asset class available to individual investors. This clearly argues in favor of including this asset class in our model portfolios. However, we still have a big concern: the lack of an indexed investment vehicle. The range of manager performance in private equity is very wide, and the fees charged by recently launched closed end private equity funds are quite high. This creates the following potential problem: The allocation to private equity in our model portfolio would be based on the performance of a private equity index. However, because of the wide dispersion in the performance of different private equity firms around the index average, it is quite possible that the return on a specific private equity fund could substantially diverge from the return on the index (e.g., have a very large tracking error). At this point, we are leaning towards making private equity an optional asset class in our model portfolios, and setting a low cap on any allocation that is made to it.

We are more enthusiastic about including U.S. equity market volatility in our model portfolios. The reason for this is the well-documented inverse relationship between equity market volatility and returns. When the former rises, the latter tends to fall (see, for example, "The Cross Section of Volatility and Expected Returns" by Ang, Hodrick, Xing and Zhang). A futures contract is currently available whose value is linked to changes in the VIX index. This measures changes in the volatility implied by the current price of put and call options on the Standard and Poor's 100 index (that covers the largest companies listed on U.S. equity markets). Volatility is increasingly an asset class used by institutional investors because of its diversification benefits. At this point, the big obstacle we face is the lack of any index vehicles that make it possible for individual investors to easily access this asset class (apart from trading the futures themselves).

ISSN 1554-5075

Finally, we come to hedge funds. As we noted in our January, 2004 issue, these are not, strictly speaking, an asset class. Rather, they are a collection of diverse investment strategies (often employing leverage, shorting, and/or derivatives) that make use of other asset classes. However, because, to varying degrees, their returns have very low correlations with many traditional asset classes, we have included them as an option in our target return portfolios. As we have repeatedly noted, hedge funds raise a number of serious asset allocation issues, including the questionable accuracy of the indexes used to track their returns, and the significant non-normality of their return distributions. On the other hand, more and more hedge fund index products are becoming available, as well as mutual funds that employ hedge fund like strategies and are available to individual investors. Examples of the latter include the Hussman Strategic Growth Fund (HSGFX) and the PIMCO All-Asset Fund (PASAX). We like both of these, as they roughly mimic the equity market neutral and global macro strategies that our previous analysis found worked best in conjunction with the other asset classes included in our model portfolios. Given the availability of these products, we are considering expanding the definition of possible hedge fund asset classes to include separate allocations to the equity market neutral and global macro styles, in addition to an overall hedge fund index.

The other variables that are important to include in an asset allocation analysis are those related to intermediate cash flows, including additional savings and portfolio rebalancing. With respect to the former, there is an obvious question as to how these should be divided between different asset classes. Common sense tells you that they should be directed at asset classes that appear undervalued by some measure; doing this might be expected to increase the long-term compound return on an investor's portfolio. Our challenge this year is to model this in a way that produces a simple set of decision rules for investors to use.

With respect to rebalancing, the first question is, "why do it at all?" To be sure, we could formulate our model so that it produced an initial asset class allocation on the assumption of no future rebalancing. However, this would also impact a distinct tilt toward a momentum style in our model portfolios. By definition, market capitalization weighted index funds buy shares that are rising in price, and sell those that are falling (or standing still). To put it differently, they buy recent winners, and sell recent losers. On its own, this would make

ISSN 1554-5075

sense in a world where markets were always fairly valued; and asset class returns were truly random. However, the available evidence suggests that neither of these propositions is true. As we have previously noted, returns are a function not only of changes in fundamental factors, but also investor behavior (and investors' assumptions about other investors' future behavior, ad infinitum). Moreover, because some investors are not concerned with long-term valuation (say, fund managers who are more concerned about beating other managers' performance in the current year), they may quite rationally choose to invest in assets they know to be overvalued. Both of these factors can cause share prices to overshoot their "fair" value, only to come crashing back down to it later on. It is therefore important to find a means of hedging an index investor's momentum-related risk (i.e., the risk of consistently being overweight overvalued investments, and underweight undervalued investments within a given asset class).

Obviously, one possible answer to this problem is active management. Unfortunately, the historical data show that most active managers, particularly over long periods of time, have shown themselves to be spectacularly (as a group) unable to outperform index funds. Fortunately, there is an alternative solution for index investors.

The essence of rebalancing is to systematically take advantage of the fact that asset class returns are not random, but rather tend to be mean-reverting over time. To put it differently, rebalancing systematically sells winners (which may have overshot) and buys losers (which may have undershot). The mean-reverting nature of real asset class returns makes this profitable, and over time raises portfolio returns.

Thus, when it comes to rebalancing, we need to take two key variables into account. The first is the factor that will trigger portfolio rebalancing. The most common triggers used are either a function of time (e.g., rebalance annually), or of relative asset class weights (e.g., rebalance when one or more asset classes is more than 10 percent above or below its long-term target weight). While time-based triggers are easier to use, weight-based triggers are probably more profitable over the long-run. The key to this argument is the underlying uncertainty surrounding the asset class return and risk assumptions that are used in the asset allocation model to determine asset class weights in the portfolio. For example, assume that, due to input uncertainty, the "true" or "correct" asset class weight can only be estimated within a range of plus or minus 5%. Now consider a situation in which annual rebalancing is

ISSN 1554-5075

being used, and only two asset classes are out of line – one is 4% over its target weight, and one is 4% below it. Under these circumstances, rebalancing would incur real costs, while its expected benefits might well be spurious. For this reason, we prefer to minimize transaction costs by only rebalancing when one or more asset classes is significantly over or under its target weight (e.g, by 10% or more).

The second rebalancing variable to consider is the "drift" factor to employ. For example, consider an asset class that has a target weight of 10%, but a current actual weight of 20%. Obviously, one rebalancing approach would be to bring it back down to a 10% weight in the portfolio. However, depending on the extent of expected mean reversion, it might be possible to further boost long term portfolio returns by rebalancing back to just a 5% weight. To put it differently, by going short (relative to the long term target weight) overweighted assets, and long underweighted assets, it might be possible to further enhance portfolio returns by increasing one's exposure to mean-reversion over time. Whether or not such a strategy would make sense depends on one's expectations about the relationships between different asset classes, which is the subject to which we will now turn.

How Are The Variables Related?

There are two potential ways for the variables in an asset allocation model to be related to each other: cross-sectionally, and temporally. To translate that into English, cross-sectional relationships mean that in any given year, the returns on different asset classes are not independent of each other. Intertemporal relationships mean that the returns on an asset class, or on some group of asset classes, are not independent of each other from year-to-year. Let's look at both of these relationships.

Most quantitative approaches to asset allocation take the cross-sectional relationship between asset class returns into account, in the form of a correlation matrix. The correlation coefficient between two asset class returns shows the extent and manner in which they are related to each other. At the extremes, a correlation coefficient of 1.0 means two returns move in tandem; a coefficient of (1.0) means they move in opposite directions. The notion of correlation underlies the quantitative analysis of diversification, which is the ability to limit risks and to enhance long-term returns by holding exposures to different return generating

ISSN 1554-5075

processes (i.e., asset classes). A portfolio in which the average correlation coefficient is high and positive is not well diversified, unlike a portfolio with a low average correlation coefficient. For example, over the entire 1989 to 2004 period, the average correlation between the real U.S. dollar returns on our eight core asset classes (real return bonds, investment grade bonds, foreign currency bonds, commercial property, commodities, domestic equity, foreign equity, and emerging markets equity) was only .11

Unfortunately, the issues related to intertemporal relationships between asset classes are much more difficult. There are three major intertemporal issues. The first is that over different periods of time (e.g., one year, two years, etc.), the real returns on most asset classes are not completely independent of each other (technically, their "autocorrelation" or "serial correlation" is not equal to zero over a given time period). The second is that the standard deviation of returns (i.e., volatility) on most assets is not constant over time. More specifically, volatility tends to alternate between periods when it is high and when it is low. In addition, these periods are not random; they tend to persist for a while. Finally, they tend to have an asymmetric relationship to changes in asset class returns – a sharp increase in returns will produce less of an increase in volatility than will a sharp decrease in returns.

The third difficult temporal issue is that the correlations between asset class returns also tend to change over time, in much the same manner as volatility. More specifically, correlations between most (but not all) asset classes tend to increase when volatility increases, particularly following a drop in returns. This quantitatively describes the situation when diversification benefits shrink just when they are most needed by investors' portfolios.

None of these intertemporal relationships between asset classes should come as a surprise; in fact, they are just what we would expect to see in a complex adaptive system like the global financial market. However, for our purposes they present some very important challenges for asset allocation.

Specifically, they are incredibly difficult to model accurately. There is a fundamental reason for this. As described by Alan Timmerman and Clive Granger (who won the Nobel Prize in Economics in 2003) in their paper "Efficient Market Hypotheses and Forecasting", "Forecasters constantly search for predictable patterns and affect prices when they attempt to exploit trading opportunities. Stable forecasting patterns are therefore unlikely to persist for long periods of time, and will self-destruct when discovered by a large number of investors.

ISSN 1554-5075

This gives rise to 'non-stationarities' in the time series of financial returns, and complicates the search for successful forecasting approaches."

While there are many different approaches that have been used (which give rise to an incredible range of acronyms like ARCH, GARGH, EGARCH, etc.), one of the most promising is called "regime switching models." The essence of this concept is straightforward: at any point in time, an asset class will be operating in one of at least two possible regimes. Within each regime, the distribution of possible returns for the asset class will be different, though normally distributed (see, for example, "Strategic Asset Allocation Under Multivariate Regime Switching" by Guidolin and Timmerman, "How do Regimes Affect Asset Allocation?" by Ang and Bekaert, or "Dynamic Asset Allocation With Regime Shifts" by Boos, Schmid, and Koller). For example, one regime could have abnormally high volatility, low returns, and high return correlations with other asset classes. Another could have abnormally low volatility, high returns, and lower than normal correlation. Finally, there could be a third regime describing the "normal" state of affairs. One of the most useful characteristics of regime switching models is their ability to reproduce the non-normal return distributions and time varying volatility found in historical time series data.

For example, consider a simple analysis we performed. We started with monthly U.S. dollar real returns between 1971 and 2004 for the following six asset classes: domestic investment grade nominal return bonds, foreign currency bonds, commercial property, commodities, domestic equity and foreign developed market equity. We then calculated a rolling three year standard deviation of returns for each asset class (we used a simple average; other approaches can also be used, such as an exponentially weighted average that give more weight to more recent data). We then arbitrarily characterized three regimes: one in which rolling three year volatility was more than one standard deviation below its 30 year average (1974 to 2004), one in which it was more than one standard deviation above it, and one in the middle. The following table shows the average monthly return and rolling three year volatility for each asset class in its high and low regime:

ISSN 1554-5075

Average Monthly Real Returns and Rolling Three Year Volatility

	Domestic Bonds	Foreign Bonds	Commercial Property	Commodities	Domestic Equity	Foreign Equity
Pct in High Volatility Regime	15%	21%	17%	15%	16%	18%
Avg. Return	.11%	1.10%	.13%	1.24%	.16%	(.08%)
Avg. Volaltility	2.61%	4.08%	5.25%	7.91%	6.06%	6.27%
Pct in Low Volatility Regime	10%	28%	15%	16%	16%	15%
Avg. Return	.37%	.28%	1.24%	.06%	1.18%	.70%
Avg. Volatility	.73%	2.29%	2.72%	3.03%	2.82%	3.56%

This table makes two very interesting points. Using our simple three regime categorization, most asset classes are in their normal regime roughly two thirds of the time (foreign bonds are an exception, being in their normal regime only closer to half the time). Second, regimes make a significant difference in terms of the risk/return trade-offs experienced by investors. Second, it suggests a further potential diversification benefit of foreign currency bonds and commodities: they are the only two asset classes whose average returns increase when they are in their high volatility regime.

It also raises an obvious question: could I not make money by changing my asset allocations as regimes changed? Unfortunately, this is not as easy as it looks, for two reasons. First, asset classes are not always in the same regime. For example, the following matrix shows the correlations of our regime characterizations over the 1973 to 2004 period for the asset classes we used in our analysis:

ISSN 1554-5075

	Domestic Bonds	**Foreign Bonds**	**Commercial Property**	**Commodities**	**Domestic Equity**	**Foreign Equity**
Domestic Bonds	1					
Foreign Bonds	.29	1				
Comm. Prop.	.31	.30	1			
Commod.	(.14)	.17	.34	1		
Dom. Eq.	.07	.64	.44	.56	1	
For. Eq.	.02	.24	.41	.20	.48	1

In fact, the forecasting challenge is even more complex than this correlation matrix suggests, because of its immense potential for estimation errors. First, there is the probability that an asset class will persist in each of three states. Then there are six transition probabilities – for example, that conditional on being in regime one, a transition will occur in the next period to regime two. That adds up to 9 regime-related probabilities per asset class, or 54 for six asset classes -- plus the 15 correlations between the different asset class regime states.

And, oh yes, there are also separate estimates of expected return, standard deviation, and correlation coefficients for each asset class under each regime (an additional 81 estimates). Given the need, just in our 6 asset class, three regime example, to estimate 150 different variables, it should come as no surprise that the use of regime switching models to generate active management (market timing) profits has not met with much success (for more on this, see "Forecasting Economic and Financial Time Series with Non-Linear Models" by Clements, Franses, and Swanson and "What Causes the Forecasting Failure of Markov-Switching Models?" by Bessec and Bouabdallah). The reason for this is not hard to understand: the estimation errors involved have overwhelmed the additional benefits from more accurately modeling the intertemporal regime switching process.

The failure of regime switching models to work very well in practice leaves us in a bit of a quandary. On the one hand, because intermediate outcomes (e.g., minimizing the annual volatility of returns) are as important to many investors as the final outcome (achieving their

ISSN 1554-5075

target compound annual real return target, and its associated accumulation goal), it is important to capture the range of possible annual outcomes. However, given the limitations of regime switching models (and their close cousins, multivariate GARCH models), we are left with two alternatives. First, we can simply assume that asset class returns are normally distributed, and independent from year to year. Alternatively, we can assume that they are normally distributed, but loosely connected over time by, say, a positive serial correlation between the returns on one or two asset classes (bonds being the most likely candidate). We are attracted to the latter approach, because it is in keeping with much of the research on the modeling of complex adaptive systems. The overwhelming conclusion of this work is that while it is impossible to accurately forecast the behavior of such systems, it is still possible to make a "coarse grained" estimate of the range of possible future possibilities. Given the considerable uncertainty associated with the estimated future values of our asset class variables, we tend toward the conclusion that this is probably the most cost effective way for us to proceed this year (in terms of modeling time spent relative to usefulness of outputs).

This brings us to the larger question of how we should go about developing estimates of the future values of the variables we use in our asset allocation models.

What Are The Variables' Future Values?

Because we can never know with certainty the values of the variables used in our models, the inputs we use must be in the form of a distribution of possible values. Here there are two issues any asset allocation system must address. First, from where will you obtain your input assumptions? Second, what form will they take – will you assume asset class returns are normally distributed, or will you try to replicate, to some degree, the non-normal features of the historical distributions?

Broadly speaking, asset class input assumptions can come from one of two sources: either a sample of historical returns or the outputs from a forward looking model. The problem with historical returns is that you can never be sure how close your sample estimates are to the true distribution of returns. The difference is known as "estimation error." This is a particularly difficult problem if there is evidence that the underlying process generating historical returns has been changing over time (i.e., it is "non-stationary"). Unfortunately,

ISSN 1554-5075

there is ample evidence that many time series of financial data are non-stationary. The potential importance of estimation error also increases as the length of your forecast horizon lengthens relative to the length of the data sample you used to generate your input assumptions.

A number of different approaches have been developed to minimize the impact of estimation error when using historical returns to derive assumptions about future asset class risks and returns. Perhaps the most common approach is to impose constraints on the maximum percentage of a portfolio that can be allocated to certain asset classes where estimation errors seem more likely (see, for example, "For Better Performance, Constrain Portfolio Weights" by Frost and Savarino, or "Risk Reduction in Large Portfolios: Why Imposing the Wrong Contraints Helps" by Jagnathan and Ma). Of course, the challenge with this method lies in knowing which asset class weights to constrain, and where to set the maximum holdings.

An alternative approach is known as “shrinkage.” This is a statistical procedure that adjusts a group of estimates towards a central value, with the most extreme estimates (which, one assumes, estimation error is more likely) receiving the greatest adjustment (for example, see "Bayes Stein Estimation of Portfolio Analysis" by Philippe Jorion, or "Honey, I Shrunk the Sample Covariance Matrix" by Ledoit and Wolf). The use of shrinkage estimators raises two questions: which central tendency to use (e.g., the group average, or something else?), and what shrinkage factor to apply to each historical estimate.

A third approach is known as “resampling”. The aim of this technique is to show that, because of estimation error, many apparently different portfolios are, in fact, statistically equivalent (hence, rebalancing them doesn’t make sense). It does this by (a) repeatedly selecting returns (with replacement) from the historical distribution of returns; (b) using them to define the statistical parameters of the sampled distribution; (c) using these distributions to produce model portfolios; and then (d) averaging the asset allocations across all different model portfolios. The typical result is asset allocations to a broader range of asset classes than would have been the case if only a single sample distribution had been used (for more on this, see Efficient Asset Management by Richard Michaud). There are two potential drawbacks to the resampling approach. First, portfolios with statistically equal risk/return trade-offs can have very different asset weights, which leaves more room for discretion than

ISSN 1554-5075

some (but certainly not all) investors might prefer. More important, because the resampled returns are drawn from the same distribution, resampling implicitly assumes that the underlying return generating process is stationary; as we have seen, many are not.

Is there a right answer to the estimation error problem? Not yet. Some papers have found that resampling works best (e.g., "Resampled Frontiers vs. Diffuse Bayes: An Experiment" by Markowitz and Usmen). Others have reached the opposite conclusion (e.g., "Resampling Versus Shrinkage for Benchmarked Managers" by Michael Wolf, or "Portfolio Section with Higher Moments" by Harvey, Liechty, Liechty and Muller). A key issue in these comparisons appears to be the extent to which the “prior” or central value used in the shrinkage approach is informative. Where it is “diffuse” (i.e., has little or no value beyond the information contained in the historical data sample), resampling seems to perform best. However, where the prior is “informative”, then shrinkage seems to be the preferred approach.

This raises the question of where an informative prior might come from. Various answers have been proposed. For example, the Black-Litterman model uses the future returns implied by the current market capitalization weights of different asset classes (see, for example, “A Step-By-Step Guide to Using the Black Litterman Model by Thomas Idzorek). Others have proposed using the outputs from various forward-looking asset pricing models. As noted previously, the track record of financial forecasting models is not a strong one, which is what one would expect in a complex adaptive system (see, for example, "A Comprehensive Look at the Empirical Performance of Equity Premium Prediction" by Goyal and Welch, or "Implementing Statistical Criteria to Select Return Forecasting Models: What do We Learn?" by Bossaerts and Hillion). Moreover, other researchers have found that it is very hard to discriminate one model from another based on their respective forecasting power (see "Stock and Bond Return Predictability: The Discrimination Power of Model Selection Criteria" by Dell'Aquila and Ronchetti). As such, it remains the case that simple combinations of forecasts from different sources often prove to be the most accurate approach (see, for example, "Forecast Combinations" by Allan Timmerman). It is also true that, when using forward looking models to produce risk and return assumptions for different asset classes, model error remains a largely unavoidable possibility.

ISSN 1554-5075

Deciding on the form of the distribution of returns that will be used in an asset allocation model is also an important issue. The traditional approach has been to assume a normal distribution (which makes computation much easier), even though this is not strictly true for the historical data. In many cases, the latter are, unlike a normal distribution, somewhat skewed (i.e., asymmetric or "tilted") and have fatter than normal tails (i.e., more extreme returns than the normal distribution, or "positive kurtosis"). With the development of more powerful (and cheaper) computers, arguments have been made in favor of using non-normal distributions in asset allocation analyses, because they more accurately portray the range and frequency of possible portfolio returns. While this is relatively easy to do when using the historical data, it is much more problematic when using a forward-looking model. While approaches like regime switching models can produce forecast returns that are not normally distributed, they raise significant questions about estimation error, given the large number of assumptions required for their use.

Recent research findings have made a significant contribution to this debate. For example, in "Distribution Assumptions and Risk Constraints in Portfolio Optimization," Dietmar Maringer finds that "out of sample performance of portfolios formed using the historical empirical [i.e., non-normal] distribution is inferior to portfolios that assume a normal distribution of returns." In "On the Out of Sample Importance of Skewness and Asymmetric Dependence for Asset Allocation" by Andrew Patton of the London School of Economics finds that "for short sale constrained investor, gains from taking [non-normal distributions] into account are limited." In "Optimal Portfolio Allocation Under Higher Moments" Jondeau and Rockinger find that as long as the underlying distributions are only moderately non-normal, optimization using just the first two moments of the distribution (e.g., expected return and volatility, but not skewness and kurtosis). Finally, in "Portfolio Formation with Higher Moments and Plausible Utility", Cremers, Kritzman and Page find that using just mean and standard deviation in asset allocation analyses works reasonably well, provided that two conditions are satisfied. First, the asset classes used must have return distributions that are close to normal. Second, the assumed investor's utility function must be relatively traditional (e.g., not be focused on shortfall risk or based on Prospect Theory's assumptions that risk aversion decreases below a reference point, but increases above it). In a related paper ("Optimal Hedge Fund Allocations: Do Higher Moments Matter?"), they show

ISSN 1554-5075

why using the full non-normal distribution is preferred when these two assumptions are not satisfied. In this year's asset allocation review, our decision as to whether to explicitly take non-normal distributions into account will depend on the asset classes we use.

Finally, there is another question as to the best way to combine our various model inputs into model portfolios. Traditional mean/variance optimizers (MVO) are one period models that focus on a single objective: maximizing the expected return per unit of risk (defined as standard deviation and correlation) in a portfolio. MVO was not designed to handle the challenges faced by an investor with a long time horizon. These might include choosing the asset allocation that is expected to achieve a minimum long-term compound annual real return target while minimizing annual volatility, maximizing the expected benefit from rebalancing, and constraining the maximum amounts that can be invested in certain asset classes. The challenge here is that these types of problems are mathematically so challenging that they can only be solved approximately. It simply takes too long to exhaustively search the full landscape of possible solutions to find the single best ("optimal") one. Instead, various techniques are used (e.g., genetic algorithms, simulated annealing, threshold accepting, scatter/tabu search, etc.) to intelligently search the landscape for solutions that have a high probability of being among the best that exist.

This is what we mean when we say that our objective is to find portfolio solutions that are robust, not optimal. Our asset allocation model looks for solutions that maximize the probability of achieving an investor's goals under a wide range of possible future asset class return scenarios. To be sure, various techniques are available that can speed up the search process (e.g., mandating that allocations be changed in 5% increments), and we continue to explore new ones (see, for example, "A Monte Carlo Method for Optimal Portfolios" by Detemple, Garcia, and Rindisbacher). However, we strongly doubt that we will ever be able to point to a single portfolio solution and say, "there, that is definitely the best one." Given the wide range of uncertainties we have described in this article, that will never be possible. To put it differently, despite our best efforts, there will always be an irreducible level of uncertainty associated with long-term investing, and fallible human judgment will still be required. Nevertheless, our objective at Index Investors Inc. will continue to be the pursuit of improvements that can help investors think about this problem more logically, and raise the probability that they will achieve their long-term investing goals.

ISSN 1554-5075

Product and Strategy Notes

Another Criticism of Lifecycle Funds

Professor Robert Shiller of Yale has just published a very interesting paper on lifecycle funds ("The Life-Cycle Personal Accounts Proposal for Social Security: An Evaluation"). These funds adjust their asset allocation away from domestic stocks and toward domestic bonds as an investor nears retirement. For future asset class returns, he uses long-term real return estimates produced by Professor Elroy Dimson of London Business School. Assuming future returns mimic history (always a questionable assumption), the returns on the lifecycle accounts are not impressive. On the other hand, with better asset allocation (basically, a higher allocation to stocks) the long term results improve. The analysis we have done in connection with the construction of our model portfolios suggests that by including more asset classes, further substantial improvements are possible. Once again, the we reach the same conclusion as we have in the past. Because they use relatively few asset classes, and do not adequately take investors' post-retirement income and bequest goals and life expectancy into account, lifecycle funds should be avoided.

MSCI Launches New Global Capital Markets Index

Last month, Morgan Stanley Capital International launched a new index that combines the world's equity and bond markets into a single market capitalization weighted index. About 52% of the Global Capital Markets Index is currently allocated to equities, and 48% to bonds.

On the equity side, North America accounts for about 28% of the GCMI, Europe 15%, Asia and Pacific 6%, and emerging markets 3%. High yield and emerging markets bonds account for about 2% of the GCMI's total capitalization. Government debt accounts for 25%, of which Japan accounts for 7%. Investment grade debt accounts for the remaining 21%, of which U.S. mortgages alone account for 6.5%.

While no investment products currently track the GCMI, we wouldn't be surprised to see them introduced in the future. Unfortunately, we won't be rushing out to buy them when they are. Our reluctance is based on the problems we have with using market capitalization weighing to construct bond indexes. As described in our article last December on Investing in

ISSN 1554-5075

Debt Markets, the more we have examined this issue, the more we have concluded that Goldman Sachs has taken the right approach in the construction of its InvesTop Index, which tracks the corporate bond market (the LQD exchange traded fund tracks this index). Rather than using market capitalization weighting, which we believe produces a distorted view of value creation in the bond market, Goldman uses equal weighting, while ensuring the use of a sufficient number of issues to ensure coverage of different durations and credit ratings.

Regulatory Action is Heating Up

Many long simmering regulatory issues seem to be heating up in the United States. First, the Securities and Exchange Commission is expected to rule sometime between now and June on the use of "soft dollars." This term refers to the practice of fund managers paying trading commissions that are higher than the lowest available price, and receiving various information and research services in exchange from brokerage houses. The fundamental problem is that because these higher fees are largely hidden from fund investors (you have to ask for a separate report, and even then it is not easy to estimate them), there is an obvious temptation for a fund manager to over-trade.

This excessive trading, while bringing more information and other goodies to the fund manager, only drives up the expenses born by the fund investor, and lowers his or her return. Broadly speaking, there are two routes the SEC could take. On the one hand, it could follow the lead of the UK Financial Services Authority, and more clearly limit the range of goods and services that can be purchased with soft dollars, and require more disclosure of these payments to fund investors. On the other hand, it could require that the sell side of the business – brokerages and investment banks – unbundle their pricing, and separately charge for execution services, research and information services, and the provision of capital (e.g., when a brokerage puts its own capital at risk by directly buying a large block of shares from a fund). The latter would be a much more radical step, and could well lead to a sharp reduction in the amount of sell-side research produced. Time will tell which course of action the SEC will choose.

On another front, there is no shortage these days of the number of investigations being conducted into the use – or possibly misuse – of fee-based accounts at brokerage firms. As we have noted before, there is a world of legal difference between a financial adviser and a

ISSN 1554-5075

stockbroker. While the former has a fiduciary duty to look out for the best interests of the client, a stockbroker's primary duty is to the firm that employs him or her. His or her duty to clients is a much weaker requirement that they be sold only "suitable" investments. In recent years, as brokerage firms found their traditional business under attack from low cost discount brokers like Ameritrade and Schwab, they repackaged their stockbrokers as "financial consultants" and began to offer "fee based" accounts. Basically, investors in these products pay an annual fee, usually based on the value of the account's assets, in exchange for which they are entitled to a certain number of "free" trades and some ancillary services (e.g., a computer generated financial plan). Unsurprisingly, a lot of investors appear to have been confused by this, and some of them apparently concluded they were taken. Now, in the finest American tradition, they are complaining to the government and suing in court, or, if that route is foreclosed, taking their stockbrokers to arbitration hearings. Not only have the Securities and Exchange Commission and various prosecuting authorities taken an interest in discovering if any systematic abuses occurred, but now the National Association of Securities Dealers and New York Stock Exchange have both launched separate investigations. This brings to mind two old sayings. The first is "where there's smoke…", and the second is "caveat emptor."

Meanwhile, On The Commercial Property Front…

In the past, we have noted the potential advantages of globally diversifying one's allocation to commercial property. While in other markets products that enable investors to do this have been available for years, until recently none were available in the United States. We have previously noted a recent launch of the Fidelity International Real Estate Fund (FIREX) that filled this gap. Now Cohen and Steers have launched two similar new products. Their International Real Estate Securities Fund (IRFAX) is a mutual fund that will invest in real estate securities outside the United States. The Cohen and Steers Worldwide Realty Income Fund (CEF) is a closed end fund that will invest in real estate securities from around the globe. It will also use leverage to further increase its returns. Its expected portfolio mix will be 25% United States securities, and 75% from other countries.

  ISSN 1554-5075

Elsewhere on the real estate front, there is now an exchange traded fund available to Eurozone investors that tracks the Eurozone EPRA index of real estate securities returns. Its ticker is EEE.pa.

In the United States, despite the best efforts of the National Association of Real Estate Investment Trusts, the Federal Thrift Savings Plan (the defined contribution pension plan for federal government employees) looks like it is going to reject a recommendation that it add REITs to the line up of asset class index fund it offers to investors. Apparently, the TSP board was put off by the somewhat higher expenses associated with a REIT index fund. We think they are making a big mistake, as the potential diversification benefits would most likely exceed the increased expenses by a substantial amount. As they say, "penny wise and pound foolish…"

Last but not least, if you're like us, you may have always suspected that, under a regulatory regime that treated estate agents much differently than people who sold securities and investment funds, the former might be engaging in practices that would land the latter in jail. Moreover, considering that for most people, a house is by far the biggest investment they will ever make in life, you probably thought there was something very wrong with this system. Well, now you breath easier – not because your fears are unfounded, but because there is some evidence that your suspicions have been on target. In a recent paper ("Market Distortions When Agents Are Better Informed" by Levitt and Syverson) the authors note that "because real estate agents receive only a small share of the incremental profit when a house sells for a higher value, there is an incentive for them to convince their clients to sell their houses too cheaply and too quickly. We test this prediction by comparing home sales in which real estate agents are hired by others to sell a home to instances in which a real estate agent sells his or her own home. Consistent with theory [the authors] find homes owned by real estate agents sell for about 3.7% more than other houses, and stay on the market longer, even after controlling for a wide range of housing characteristics. Situations in which the agent's informational advantage is larger lead to even greater distortions." Just as we've always suspected…

ISSN 1554-5075

Humor from Hesh: The Cloning of Warren Buffet

We named him Warren but called him Buffy for short. Since he was able to sit up I would read him chapters from, *The Intelligent Investor: the Definitive Book on Value Investing* by Benjamin Graham. He listened attentively, but I think his favorite was a cartoon version of Adam Smith's Wealth of Nations.

My plan was simple. I was not going to invest in my company's 401K and watch my money grow miserably year in and year out. No, I was investing in my son's education. I had worked out the math. If Buffy beat the S&P 500 consistently by at least 5% a year, compounded, by the time I am 65, I would retire a very rich man.

Buffy was like many six year olds very precocious. He had a talent for memorizing facts and figures that dazzled most adults. He could name every Nobel Prize winner in Economics and for extra fun add the title of their PhD dissertations. (His grandparents gave him leather bound copies for his birthday.)

Obviously, little W was going to be home schooled. Why waste precious hours building with Lincoln logs and playing dodge ball. He had lots of material to absorb.

Once a state education inspector surprised us with an unscheduled visit and almost caught Buffy going through his stock exchange drills. It was a game he loved. We would name the company and he would give us its ticker abbreviation, or visa versa. I would try to trip him up by saying the names of companies that had merged out of existence. But he would ask "Dad you want their old ticker or their new one?"

Fortunately as soon as the inspector walked in Buffy switched to doing the multiplication tables, without missing a beat. The inspector knew Buffy was gifted and asked him what his favorite subject. Buffy said, 'History' a safe answer.

The inspector then asked him what period interested him the most. Buffy said "The financial collapse of 1873; it was a true precursor of the great depression." I laughed, my wife laughed, and fortunately the inspector laughed too, I think he just thought it was a little practical joke we played on people.

Unfortunately as Buffy became a teenager his hormones kicked in and he began rebelling. First, he practiced unprotected investing. We had told him that he could buy and

ISSN 1554-5075

sell indexed mutual funds with our supervision. Instead he had hacked into our computer and was buying gold futures on the Chicago commodity exchange.

I should have punished him but he actually made a lot of money. I decided a stern warning was sufficient. But I knew we had seen just the beginning of his teenage rebellion.

Then he did something we just never expected. He crossed the line, challenging our entire belief system. He discovered girls. He was 16 and fell hard for a 15 year old with matching nose rings.

My wife was worried that she was not Jewish; I was worried that she was a she. In desperation I called Buffy's godfather Alan Greenspan. Alan actually flew in to meet with Buffy. He had seen this behavior before in his own kids and had developed an intervention strategy that was highly successful.

We all gathered in the den with Buffy sulking in the middle on a small stool. Greenspan challenged him, reminding him that he was not only giving up a possible great personal career, but that capitalism needs him more then ever. Our balance of payments was off by 15%. Inflation was returning with vengeance like it was the late 1970's. And most disturbing, the Republicans were spending money like they were competing against FDR.

Buffy was somewhat responsive, but clearly we did not have him back. Alan decided to pull out his biggest gun. He placed a call to the real Warren Buffett. Warren was waiting to take the call.

Alan gave the phone to Buffy. To our amazement Buffy took the phone; soon he was no longer sulking on his stool, he was standing at attention. All we could hear was "Yes sir….no sir…thank you sir….promise sir." He gave the phone back to Greenspan.

He smiled so we smiled.

He looked at me, "Mr. Buffett and I negotiated a deal, I promised to continue my studies and he promised to introduce me to his granddaughter. I saw her photo in Forbes Magazine. She is hot and dad she has only one nose ring."

© Heshreinfeld 2005

Model Portfolios Update

We produce three different types of model portfolios. Each of these is based on a different portfolio construction methodology.

We use a "rule of thumb" approach (or, to use the more formal term, a "heuristic approach") to construct our benchmark portfolios. More specifically, we use three "rules of thumb" that are often cited in news stories a mix of 80% equities and 20% debt (for our high risk/high return portfolios); a mix of 60% equities and 40% debt (for our moderate risk/moderate return portfolios); and a mix of 20% equities and 80% debt (for our low risk/low return portfolios). Using different terminology, somebody else might call these three portfolios aggressive, balanced, and conservative. We implement these three rules of thumb in two different ways (to construct six different benchmark portfolios). The first uses just two asset classes: domestic investment grade bonds and domestic equity. The second uses a broader mix of asset classes: domestic and foreign investment grade bonds, and domestic and foreign (including emerging market) equity. In addition to these 80/20, 60/40, and 20/80 portfolios, we also provide our "couch potato" portfolio. This portfolio is equally allocated to all of the asset classes we use. More formally, this is known as the "1/N heuristic," which research has shown is an approach used by a significant proportion of retirement plan investors. This portfolio implicitly assumes that it is impossible to accurately forecast future asset class risk and return; consequently, the best approach is to equally divide one's exposure to different sources of return (and risk). While we disagree with this assumption, intellectual honesty compels us to include the "couch potato" portfolio as one of our benchmarks. Finally, each year we also benchmark all our portfolios against the return from holding cash. We define this return as the yield to maturity on a one-year government security purchased at the end of the previous year. For 2005, the A$ cash benchmark return is 5.06% (nominal).

The goal of our second set of model portfolios is to either deliver more return than the domestic benchmark portfolios, while taking on no more risk, or to deliver the same level of return while taking on less risk. To develop these model portfolios, we use a methodology known as "mean/variance optimization" or MVO. This approach uses three variables for each asset class (its expected return, standard deviation of returns, and correlation of returns with other asset classes) to construct different combinations of portfolios which maximize return

ISSN 1554-5075

per unit of risk (another way of looking at this is that they minimize risk per unit of return). The MVO technique has some significant limitations. While it is a good approach to single year portfolio optimization problems, in multiyear settings it fails to adequately take into account the fact that poor portfolio performance in early years can substantially reduce the probability of achieving long term goals. It also fails to adequately account for most people's intuitive understanding of risk: what's important isn't standard deviation (the dispersion of annual returns around their mean), but rather the chance that I will fall short of my long-term goals. Given these limitations, our MVO portfolios are most appropriate for managers whose performance is evaluated on an annual basis in comparison to one of our benchmarks.

Our third set of model portfolios uses a simulation optimization methodology. It assumes that an investor understands the long-term compound real rate of return he or she needs to earn on his or her portfolio to achieve his or her long-term financial goals. We use SO to develop a multi-period asset allocation solutions that are “robust”. They are intended to maximize the probability of achieving an investor’s compound annual return target under a wide range of possible future asset class return scenarios. More information about the SO methodology is available on our website. Using this approach, we produce model portfolios for three different compound annual real return targets: 7%, 5%, and 3%. We produce two sets of these portfolios: one includes hedge funds as a possible asset class, and one does not.

The year-to-date results for all these model portfolios are shown in the tables on the following pages.

ISSN 1554-5075

Model Portfolios Year-to-Date Performance

These portfolios seek to maximize return while matching their benchmark's risk (standard deviation)			
	YTD 29Apr05	**Weight**	Weighted Return
	In A$		In A$
High Risk Portfolio			
Asset Classes			
Australia Benchmark			
Australian Equity	1.2%	**80%**	**1.0%**
Australian Bonds	-0.2%	**20%**	**0.0%**
		100%	**0.9%**
Global Benchmark			
U.S. Equity	-4.3%	**40%**	**-1.7%**
Non-U.S. Equity	-1.7%	**40%**	**-0.7%**
U.S. Bonds	1.3%	**10%**	**0.1%**
Non-U.S. Bonds	-1.9%	**10%**	**-0.2%**
		100%	**-2.5%**
Recommended			
Australian Equity	1.2%	**30%**	**0.4%**
Foreign Equity (US)	-4.3%	**23%**	**-1.0%**
Foreign Equity (EAFE)	-1.8%	**18%**	**-0.3%**
Australian Bonds	-0.2%	**19%**	**0.0%**
Commodities	6.8%	**10%**	**0.7%**
		100%	**-0.3%**

ISSN 1554-5075

These portfolios seek to maximize return while matching their benchmark's risk (standard deviation)			
	YTD 29Apr05	**Weight**	Weighted Return
	In A$		In A$
Medium Risk Portfolio			
Asset Classes			
Australia Benchmark			
Australian Equity	1.2%	**60%**	**0.7%**
Australian Bonds	-0.2%	**40%**	**-0.1%**
		100%	**0.7%**
Global Benchmark			
U.S. Equity	-4.3%	**30%**	**-1.3%**
Non-U.S. Equity	-1.7%	**30%**	**-0.5%**
U.S. Bonds	1.3%	**20%**	**0.3%**
Non-U.S. Bonds	-1.9%	**20%**	**-0.4%**
		100%	**-1.9%**
Recommended			
Australian Equity	1.2%	**25%**	**0.3%**
Foreign Equity (US)	-4.3%	**14%**	**-0.6%**
Australian Bonds	-0.2%	**40%**	**-0.1%**
Commodities	6.8%	**10%**	**0.7%**
Foreign Equity (EAFE)	-1.8%	**11%**	**-0.2%**
		100%	**0.1%**

ISSN 1554-5075

These portfolios seek to maximize return while matching their benchmark's risk (standard deviation)			
	YTD 29Apr05	**Weight**	**Weighted Return**
	In A$		In A$
Low Risk Portfolio			
With suggested US Index Funds			
Australia Benchmark			
Australian Equity	1.2%	**20%**	**0.2%**
Australian Bonds	-0.2%	**80%**	**-0.2%**
		100%	**0.1%**
Global Benchmark			
Foreign Equity (US)	-4.3%	**10%**	**-0.4%**
Non-U.S. Equity	-1.7%	**10%**	**-0.2%**
U.S. Bonds	1.3%	**40%**	**0.5%**
Non-U.S. Bonds	-1.9%	**40%**	**-0.8%**
		100%	**-0.8%**
Recommended			
Australian Equity	1.2%	**10%**	**0.1%**
Foreign Equity (US)	-4.3%	**8%**	**-0.3%**
Australian Bonds	-0.2%	**60%**	**-0.1%**
Global Bonds	-0.1%	**8%**	**0.0%**
Foreign Equity (EAFE)	-1.8%	**7%**	**-0.1%**
Commodities	6.8%	**7%**	**0.5%**
		100%	**0.0%**
Global Bond Index = 50% US$ plus 50% Non-US$ Bonds			

ISSN 1554-5075

These portfolios seek to minimize risk while matching their benchmark's returns.			
	YTD 29Apr05	**Weight**	**Weighted Return**
	In A$		In A$
High Return Portfolio			
Asset Classes			
Australia Benchmark			
Australian Equity	1.2%	**80%**	**1.0%**
Australian Bonds	-0.2%	**20%**	**0.0%**
		100%	**0.9%**
Global Benchmark			
U.S. Equity	-4.3%	**40%**	**-1.7%**
Non-U.S. Equity	-1.7%	**40%**	**-0.7%**
U.S. Bonds	1.3%	**10%**	**0.1%**
Non-U.S. Bonds	-1.9%	**10%**	**-0.2%**
		100%	**-2.5%**
Recommended			
Australian Equity	1.2%	**11%**	**0.1%**
Foreign Equity (US)	-4.3%	**19%**	**-0.8%**
Australian Bonds	-0.2%	**45%**	**-0.1%**
Foreign Equity (EAFE)	-1.8%	**15%**	**-0.3%**
Commodities	6.8%	**10%**	**0.7%**
		100%	**-0.4%**

ISSN 1554-5075

These portfolios seek to minimize risk while matching their benchmark's returns.			
	YTD 29Apr05	**Weight**	**Weighted Return**
	In A$		In A$
Medium Return Portfolio			
Asset Classes			
Australia Benchmark			
Australian Equity	1.2%	60.0%	0.7%
Australian Bonds	-0.2%	40.0%	-0.1%
		100%	0.7%
Global Benchmark			
U.S. Equity	-4.3%	30%	-1.3%
Non-U.S. Equity	-1.7%	30%	-0.5%
U.S. Bonds	1.3%	20%	0.3%
Non-U.S. Bonds	-1.9%	20%	-0.4%
		100%	-1.9%
Recommended			
Australian Equity	1.2%	10%	0.1%
Foreign Equity (US)	-4.3%	7%	-0.3%
Foreign Equity (EAFE)	-1.8%	5%	-0.1%
Australian Bonds	-0.2%	60%	-0.1%
Global Bonds	-0.1%	13%	0.0%
Commodities	6.8%	5%	0.3%
		100%	**-0.1%**

ISSN 1554-5075

These portfolios seek to minimize risk while matching their benchmark's returns.			
	YTD 29Apr05	**Weight**	**Weighted Return**
	In A$		In A$
Low Return Portfolio			
Asset Classes			
Australia Benchmark			
Australian Equity	1.2%	20.0%	0.2%
Australian Bonds	-0.2%	80.0%	-0.2%
		100%	0.1%
Global Benchmark			
U.S. Equity	-4.3%	10.0%	-0.4%
Non-U.S. Equity	-1.7%	10.0%	-0.2%
U.S. Bonds	1.3%	40.0%	0.5%
Non-U.S. Bonds	-1.9%	40.0%	-0.8%
		100%	-0.8%
Recommended			
Australian Equity	1.2%	12.0%	0.1%
Emerging Mkt Equity	-1.1%	3.0%	0.0%
Australian Bonds	-0.2%	60.0%	-0.1%
Global Bonds	-0.1%	25.0%	0.0%
		100%	**0.0%**
Global Bond Index = 50% US$ plus 50% Non-US$ Bonds			

ISSN 1554-5075

These portfolios seek to maximize the probability of achieving at least the target real return over twenty years, at the lowest possible risk.			
	YTD 29Apr05	**Weight**	**Weighted Return**
	In A$		In A$
7% Target Real Return	*YTD Returns are Nominal*		
Asset Classes			
Australian Real Return Bonds	2.1%	0%	**0.0%**
Australian Bonds	-0.2%	3%	**0.0%**
Global Bonds	-0.1%	7%	**0.0%**
Commercial Property	-5.5%	3%	**-0.2%**
Commodities	6.8%	17%	**1.2%**
Australian Equity	1.2%	25%	**0.3%**
Foreign Equity (USA)	-4.3%	21%	**-0.9%**
Foreign Equity (EAFE)	-1.8%	16%	**-0.3%**
Emerging Equity	-1.1%	8%	**-0.1%**
Hedge Funds	-0.7%	0%	**0.0%**
		100%	**0.0%**
	YTD 29Apr05	**Weight**	**Weighted Return**
	In A$		In A$
5% Target Real Return	*YTD Returns are Nominal*		
Asset Classes			
Australian Real Return Bonds	2.1%	17%	**0.4%**
Australian Bonds	-0.2%	5%	**0.0%**
Global Bonds	-0.1%	2%	**0.0%**
Commercial Property	-5.5%	3%	**-0.2%**
Commodities	6.8%	20%	**1.4%**
Australian Equity	1.2%	18%	**0.2%**
Foreign Equity (USA)	-4.3%	17%	**-0.7%**
Foreign Equity (EAFE)	-1.8%	13%	**-0.2%**
Emerging Equity	-1.1%	5%	**-0.1%**
Hedge Funds	-0.7%	0%	**0.0%**
		100%	**0.7%**

…

ISSN 1554-5075

	YTD 29Apr05	Weight	Weighted Return
	In A$		In A$
3% Target Real Return	*YTD Returns are Nominal*		
Asset Classes			
Australian Real Return Bonds	2.1%	56%	**1.2%**
Australian Bonds	-0.2%	10%	**0.0%**
Global Bonds	-0.1%	7%	**0.0%**
Commercial Property	-5.5%	0%	**0.0%**
Commodities	6.8%	12%	**0.8%**
Australian Equity	1.2%	5%	**0.1%**
Foreign Equity (USA)	-4.3%	6%	**-0.3%**
Foreign Equity (EAFE)	-1.8%	4%	**-0.1%**
Emerging Equity	-1.1%	0%	**0.0%**
Hedge Funds	-0.7%	0%	**0.0%**
		100%	**1.7%**

…

ISSN 1554-5075

These portfolios seek to maximize the probability of achieving at least the target real return over twenty years, at the lowest possible risk.		***Unlike the other target real return portfolios, these allow investment in a hedge fund index.***	
	YTD 29Apr05	**Weight**	**Weighted Return**
	In A$		In A$
7% Target Real Return	*YTD Returns are Nominal*		
Asset Classes			
Australian Real Return Bonds	2.1%	0%	**0.0%**
Australian Bonds	-0.2%	2%	**0.0%**
Global Bonds	-0.1%	7%	**0.0%**
Commercial Property	-5.5%	15%	**-0.8%**
Commodities	6.8%	8%	**0.5%**
Australian Equity	1.2%	21%	**0.3%**
Foreign Equity (USA)	-4.3%	15%	**-0.6%**
Foreign Equity (EAFE)	-1.8%	12%	**-0.2%**
Emerging Equity	-1.1%	15%	**-0.2%**
Hedge Funds	-0.7%	5%	**0.0%**
		100%	**-1.1%**
	YTD 29Apr05	**Weight**	**Weighted Return**
	In A$		In A$
5% Target Real Return	*YTD Returns are Nominal*		
Asset Classes			
Australian Real Return Bonds	2.1%	0%	**0.0%**
Australian Bonds	-0.2%	8%	**0.0%**
Global Bonds	-0.1%	10%	**0.0%**
Commercial Property	-5.5%	12%	**-0.7%**
Commodities	6.8%	12%	**0.8%**
Australian Equity	1.2%	25%	**0.3%**
Foreign Equity (USA)	-4.3%	13%	**-0.6%**
Foreign Equity (EAFE)	-1.8%	10%	**-0.2%**
Emerging Equity	-1.1%	8%	**-0.1%**
Hedge Funds	-0.7%	2%	**0.0%**
		100%	**-0.4%**

ISSN 1554-5075

	YTD 29Apr05	Weight	Weighted Return
	In A$		In A$
3% Target Real Return	*YTD Returns are Nominal*		
Asset Classes			
Australian Real Return Bonds	2.1%	65%	**1.3%**
Australian Bonds	-0.2%	5%	**0.0%**
Global Bonds	-0.1%	3%	**0.0%**
Commercial Property	-5.5%	4%	**-0.2%**
Commodities	6.8%	5%	**0.3%**
Australian Equity	1.2%	3%	**0.0%**
Foreign Equity (USA)	-4.3%	7%	**-0.3%**
Foreign Equity (EAFE)	-1.8%	6%	**-0.1%**
Emerging Equity	-1.1%	0%	**0.0%**
Hedge Funds	-0.7%	2%	**0.0%**
		100%	**1.1%**

	YTD 29Apr05	Weight	Weighted Return
	In A$		In A$
Equally Weighted Portfolio	*YTD Returns are Nominal*		
Asset Classes			
Australian Real Return Bonds	2.1%	12.5%	**0.3%**
Australian Bonds	-0.2%	12.5%	**0.0%**
Global Bonds	-0.1%	12.5%	**0.0%**
Commercial Property	-5.5%	12.5%	**-0.7%**
Commodities	6.8%	12.5%	**0.8%**
Australian Equity	1.2%	12.5%	**0.2%**
Foreign Equity (USA)	-4.3%	7.3%	**-0.3%**
Foreign Equity (EAFE)	-1.8%	5.2%	**-0.1%**
Emerging Equity	-1.1%	12.5%	**-0.1%**
Total		100.0%	**0.0%**

ISSN 1554-5075